



# ENERGY STAR® Program Requirements for Exit Signs

## Draft 1 - Eligibility Criteria – Version 3.0

Below is the **Draft 1** product specification (Version 3.0) for ENERGY STAR qualified exit signs. A product must meet all of the identified criteria if it is to be qualified as ENERGY STAR by its manufacturer.

1) **Definitions:** Below are the definitions of relevant terms in this document.

A. **Exit Sign:** An illuminated sign that is permanently fixed in place and used to identify an exit. For the purposes of ENERGY STAR, an exit sign must have a legally required legend that is illuminated by an integral light source and the background of the sign may not be transparent or a mirror. The sign is designed to remain illuminated via an emergency power source upon failure of the normal power supply.

***Note:** It is EPA's intent to broaden the definition of an exit sign to include signs with varying light sources. The restriction that exit signs must be "internally-illuminated" is **not** included in the definition of an exit sign in this draft. **However, for EPA to accurately assess the energy efficiency of any model, it is necessary to consider an exit sign along with the input power demand of its illuminating light source.** Therefore, under this specification, a photoluminescent exit sign model may pursue ENERGY STAR qualification only if it can be evaluated with the specific charging light source marked on the face of the sign, per the marking instructions in the UL 924 Standard for Emergency Lighting and Power Equipment. EPA welcomes manufacturer input on the feasibility of evaluating photoluminescent signs with this method.*

*If a separate charging light source must be installed to properly illuminate a photoluminescent exit sign, for example, that sign has not contributed to the overall energy efficiency of the building. EPA would be remiss to allow the label on these signs without considering the power consumption of the light source required to provide the necessary illumination. EPA is not satisfied that ambient light in buildings is always sufficient to charge photoluminescent exit signs. For this reason, it is necessary for EPA to consider the input power demand of the charging light source when determining the energy efficiency of a photoluminescent exit sign.*

B. **Exit:** A path of egress from a building or structure.

C. **Legally Required Legend:** The words "EXIT", "TO EXIT", "STAIR", "TO STAIR", "STAIRS", "TO STAIRS", "FIRE ESCAPE", "TO FIRE ESCAPE", "FIRE EXIT", and "TO FIRE EXIT". This definition will also encompass other combinations of letters and symbols if and when analytical measurement points for pictograms and non-English legends are developed by Underwriters Laboratories, Inc.

D. **Integral Light Source:** A component light source of the exit sign model that illuminates either the legend including directional indicators, where applicable, or the background of the legend.

E. **Exit Sign Model:** For the purposes of ENERGY STAR, an exit sign model is an exit sign in the configuration that is actually packaged and sold to end users under a unique model number or name. For exit sign models with an individual rechargeable battery, the battery charger shall be included as part of the exit sign model and shall be tested and qualified as a single product.

F. **Input Power Demand:** The amount of active power required to continuously illuminate an exit sign model, measured in watts (W). For exit sign models with rechargeable batteries, input power demand shall be measured with batteries at full charge.

G. **Power Factor**: A measurement that determines how effectively power drawn by the equipment is converted into actual usable power by an electric component. Power Factor is the ratio between active (useful) power, measured in watts, and apparent power, measured in volt-amperes.

H. **Lagging Power Factor**: With an inductive load, the current lags the applied voltage in a clockwise direction represented on a vector diagram, and is said to be a lagging power factor.

I. **Leading Power Factor**: With a capacitive load, the current leads the applied voltage in a clockwise direction represented on a vector diagram, and is said to be a leading power factor.

J. **Luminance**: The luminance of a surface is the luminous intensity in a given direction per unit area of that surface as viewed from that direction. Luminance is measured in candelas per square meter ( $\text{cd/m}^2$ ). An older unit for luminance is footlamberts ( $1 \text{ fL} = 3.43 \text{ cd/m}^2$ ).

K. **Luminance Contrast**: The luminance contrast quantifies the relative brightness of an object against its background. For exit signs, the relevant contrast is between the luminance of the letters and the luminance of the rest of the sign face (background). The luminance contrast can vary from zero to one. The closer the luminance contrast is to one, the more visible the letters are against the rest of the sign face.

L. **Average Luminance**: The sum of luminance measurements of either the legend, including directional indicators where applicable, or the background of the legend, whichever is higher, divided by the number of measurements.

M. **Minimum Luminance**: The lowest luminance measurement of either the legend, including directional indicators where applicable, or the background of the legend, whichever is higher.

N. **Luminance Uniformity Ratio**: Luminance uniformity ratio is the ratio of the highest to lowest luminance measurements of either the legend, including directional indicators where applicable, or the background of the legend, whichever is higher.

O. **NFPA**: The National Fire Protection Association (United States) develops the Life Safety Code for buildings that provides guidance for building design, construction, operation, and maintenance to protect occupants from fire, smoke, and fumes or similar emergencies. Many states and localities adopt this Life Safety Code into their own Building Code standards.

P. **NRTL**: Nationally Recognized Testing Laboratory Program, which is a part of OSHA's Directorate of Technical Support.

Q. **OSHA**: Occupational Safety & Health Administration.

R. **UL**: Underwriters Laboratories is an OSHA NRTL that develops UL 924, the Standard for Safety for Emergency Lighting and Power Equipment.

- 2) **Qualifying Products**: In order to qualify as ENERGY STAR, an exit sign must meet the definition in Section 1A and the specifications in Section 3. In addition, ENERGY STAR requires that each model be tested to and meet the UL 924 Standard for Emergency Lighting and Power Equipment. Information about testing to this standard is included in Section 4. This agreement does not apply to exit sign retrofit kits.

*Note: Testing to UL 924 must be completed by an organization recognized by the Occupational Safety & Health Administration (OSHA) as a Nationally Recognized Testing Laboratory (NRTL). A list of OSHA NRTL's may be found at: <http://www.osha.gov/dts/otpca/nrtl/NRTLs>.*

- 3) **Specifications for Qualifying Products**: Only those products listed in Section 2 (Qualifying Products) that meet the criteria below in Table 1 may qualify as ENERGY STAR.

A: **Luminance Depreciation**: Partner must include a statement in product materials that acknowledges

luminance depreciation of the light source over time, and explains that code requirements for average luminance may not be maintained without lamp replacement at targeted intervals during the lifetime of the exit sign. A statement shall be included such as, “The light source in this exit sign will depreciate, which can lead to a light output level that is below current building code requirements. The light source (lamps) should be replaced at regular intervals, and when they are no longer functioning, to assure safety and visibility in the event of an emergency.” Any other statement must be approved in advance by EPA. This statement must appear in the user manual or installation instructions.

<b>Table 1: Product Specifications For ENERGY STAR Qualified Exit Signs (Version 3.0)</b>	
<b>Energy-Efficiency Characteristics</b>	<b>Performance Specification</b>
Input power demand	3 watts or less per sign
Power factor	A leading power factor, or a lagging power factor not less than 0.7
<b>Visibility Characteristics</b>	<b>Performance Specification</b>
Luminance contrast	Greater than 0.8
Average luminance	Greater than 15 cd/m <sup>2</sup> measured at normal (0°) and 45° viewing angles
Minimum luminance	Greater than 8.6 cd/m <sup>2</sup> measured at normal (0°) and 45° viewing angles
Luminance uniformity ratio	Less than 20:1 measured at normal (0°) and 45° viewing angles
<b>Reliability Characteristic</b>	<b>Specification</b>
Manufacturer warranty for defects in materials and manufacturing	Replacement of defective parts for 5 years from date of purchase

***Note:** This draft specification has lowered the input power demand from 5 watts per face or less to **3 watts per sign** or less. It is EPA’s intent to continually recognize approximately the top 25% of available products in terms of energy efficiency. Based on analysis of the ENERGY STAR qualified products database (which may be viewed at [www.energystar.gov](http://www.energystar.gov)), conversations with manufacturers, and additional market research, it is believed that this specification will achieve this goal with the combination of a lower input power demand and inclusion of a power factor criterion.*

*This draft specification contains a performance criterion for power factor. It is EPA’s intent to lessen the effect of exit signs with low power factor ratings on the overall system power factor in buildings.*

*EPA has received varied opinions from manufacturers and other interested parties with regard to the visibility characteristics for luminance in the Version 2.0 specification. With the release of a Version 3.0 specification, it is EPA’s intent to recognize product efficiency, while maintaining the highest degree of safety in ENERGY STAR qualified signs. Therefore, EPA intends to retain the existing visibility criteria. This will ensure that newly qualified signs are held to the same performance standard as previously submitted models. In addition, EPA believes that this visibility measurement protocol offers the greatest consistency in measurement of exit signs.*

*In this draft specification, EPA has retained the requirement that qualified exit signs have a five year manufacturer warranty. Discussions with industry indicate that a five year warranty is more than sufficient to ensure a reliable, high-quality exit sign.*

- 4) **Test Procedure:** Manufacturers are required to perform tests to determine if an exit sign product model meets the product specifications in Section 3, Table 1. Only signs that are listed under UL 924 may be evaluated to these criteria. Section A provides further explanation about the UL 924 listing requirement. To determine if the product model meets the specifications in Section 3, Table 1, all performance measurements and calculations must be completed as described Sections B and C. Section B explains the general test conditions for ENERGY STAR qualified exit signs, and Section C outlines the specific procedures for measurement and calculation of the product specifications in Section 3, Table 1. Section D explains partners’ requirements for submitting qualified product data to ENERGY STAR.

A: Listing under Standard UL 924: Manufacturers may only submit candidate exit signs that have been tested to and meet the UL 924 Standard for Emergency Lighting and Power Equipment. The testing must be completed by an organization recognized by the Occupational Safety & Health Administration (OSHA) as a Nationally Recognized Testing Laboratory (NRTL). A list of OSHA NRTL's may be found at: <http://www.osha.gov/dts/otpc/nrtl/NRTLs>.

*Note: ENERGY STAR includes this requirement as UL tests emergency lighting and power equipment to assess a variety of safety and performance characteristics not addressed in this specification. On a Qualified Product Information form, partners will be asked to certify that the reported exit sign model meets UL 924.*

B. Test Conditions for Product Specifications in Section 3, Table 1:

Testing shall be conducted in clear (non-smoke) conditions.

All measurements shall be made in a stable ambient air temperature of  $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ .

All voltages shall be provided within  $\pm 0.5\%$  by a constant voltage power supply.

Prior to input power or photometric measurements, the exit sign model shall be operated at the rated input voltage for a period of 100 hours. In addition, the exit sign model with an internal battery shall be operated from the battery for one-and-one-half<sup>1</sup> hours, the minimum period of emergency operation specified in NFPA's "Life Safety Code", and then recharged for the period specified by the sign manufacturer.

All of the light sources in the exit sign model must produce light throughout the first 100 hours of operation, before any measurements are taken, in order to meet the requirements of this specification.

C. Measurement and Calculation of Product Specifications in Section 3, Table 1:

1. Input power demand measurement

The input power demand of the exit sign model in its entirety shall be measured with an appropriate True RMS Watt Meter at the rated input voltage which represents normal operation. For an exit sign model that includes a battery, the battery circuit shall be connected and the battery fully charged before any measurements are made.

2. Power factor measurement

At the time of testing for input power demand, the magnitude and waveform of the voltage and current and measurement between them shall also be measured, calculated, and reported. Testing results shall include:

- Active power measured in watts
- Apparent power based on the formula (rms volt-amperes)
- Power factor based on the formula:

$$\text{Power factor} = \frac{\text{Active power (watts)}}{\text{Total apparent power (rms volt-amperes)}}$$

- Indication of whether the power factor is leading or lagging

3. Photometric measurements

---

<sup>1</sup> As in current NFPA 101, *Life Safety Code*, 7.9.2.1.

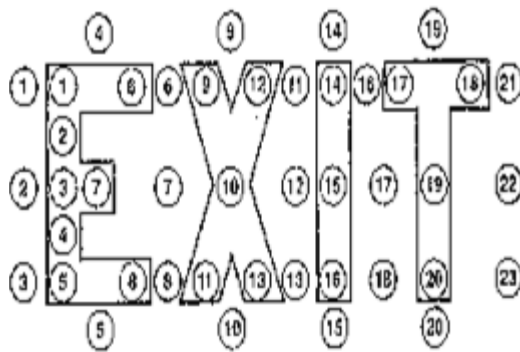
Each of the photometric characteristics of the sign shall be measured at three voltages:

- The rated input voltage which represents normal operation.
- A voltage corresponding to the minimum voltage provided either by the internal battery or a remote emergency power source after one minute of operation, as applicable.
- A voltage corresponding to the minimum voltage provided by the internal battery after the marked rated operating time or at 87.5% of the rated emergency input voltage for signs intended to be connected to a remote emergency power source. The level of illumination of the exit sign shall be permitted to decline to 60 percent of the initial illumination level (specified in Section 3 of the Eligibility Criteria) at the end of the emergency lighting time duration.

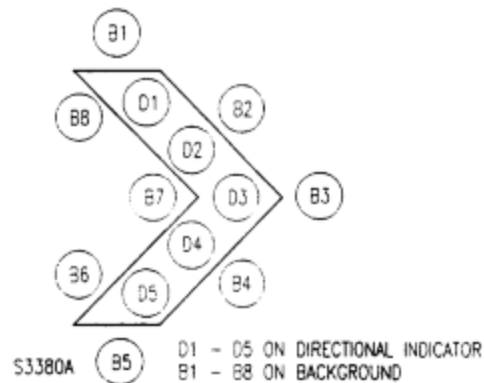
All measurements shall be taken with less than 0.01 footcandles of external illumination on the face of the exit sign model.

#### 4. Luminance measurement positions

The positions where the luminances for the legend and background of the exit sign are to be measured are shown below<sup>2</sup>. For instances in which exit sign model has a directional indicator, the positions where the luminances for the directional indicator and its background are to be measured are also shown below<sup>3</sup>. The luminances shall be measured from two viewing angles: 1) from normal (0°) to the face of the exit sign, and 2) from 45° to the face of the exit sign.



**Measurement of exit sign luminance**



**Measurement of directional indicator**

The luminances for each numbered position in the legend and directional indicator shall be measured over a circular area as large as possible while maintaining at least a 1.6 mm distance between the perimeter of the circular area and the adjacent border. The positions for measuring the luminances of the background shall lie within 25.4 mm of the legend and directional indicator but no closer than 1.6 mm to the border.

#### 5. Luminance Calculations

Luminance contrast: The difference in average luminances between the legend and background of the legend, divided by the greater average luminance.

<sup>2</sup> "Measurement of exit sign luminance" in NFPA 101, *Life Safety Code*, Figure A.7.10.6.3

<sup>3</sup> Found in Figure 40.9 "Directional indicator luminance measurement points" in UL 924, *Standard for Safety: Emergency Lighting and Power Equipment*, July 11, 2001.

$$C = (L_{\text{greater}} - L_{\text{lesser}}) / L_{\text{greater}}$$

where C = luminance contrast

$L_{\text{greater}}$  = luminance of the legend or the background, whichever is the greater (cd/m<sup>2</sup>)

$L_{\text{lesser}}$  = luminance of the legend or the background, whichever is the lesser (cd/m<sup>2</sup>)

Where  $L_g$  is the greater luminance and  $L_e$  is the lesser luminance, either the variable  $L_g$  or  $L_e$  may represent the legend or directional indicator, and the remaining variable shall represent the respective background.

Average luminance of the legend or background of the legend, whichever is higher, and where applicable, the directional indicator or its background, whichever is higher. For each, the mean of the luminances of all the positions measured.

Minimum luminance of the legend or background of the legend, whichever is higher, and where applicable, the directional indicator and its background, whichever is higher. For each, the lowest luminance of all the points measured.

Luminance uniformity ratio of the legend or background of the legend, whichever is higher, and where applicable, the directional indicator and its background, whichever is higher. For each, the ratio of the highest luminance of any position measured to the lowest luminance of any position measured.

D: Submittal of Qualified Product Data to ENERGY STAR: Partners are required to self-certify those product models that meet the ENERGY STAR guidelines and report information to ENERGY STAR on a Qualified Product Information form.

Note: Once the Version 3.0 specification has been finalized, EPA will create an updated Qualified Product Information (QPI) form that manufacturers will use to report qualified product data.

- 5) **Effective Date:** The date that manufacturers may begin to qualify products as ENERGY STAR under the Version 3.0 specification will be defined as the *effective date* of the agreement. Any previously executed agreement on the subject of ENERGY STAR labeled exit signs shall be terminated effective December 31, 2002. The ENERGY STAR Exit Sign (Version 3.0) specification shall go into effect on **January 1, 2003.**

- A. Qualifying and Labeling Products under the Version 3.0 Specification: All products, including models originally qualified under Version 2.0, with a **date of manufacture** after January 1, 2003, must meet Version 3.0 requirements in order to bear the ENERGY STAR label on the product or in product literature. The date of manufacture is specific to each unit, and is the date on which a unit is considered to be completely assembled.

*Note: On January 1, 2003, EPA will begin to edit the Web list of ENERGY STAR qualified exit signs. Product models that were originally qualified under the Version 2.0 specification will be removed from the list. If a product model meets the Version 3.0 specification, the partner will need to submit its testing results to EPA on a QPI form in order for the product to remain on the list of qualified exit sign models. The models for which EPA does not receive updated QPI forms will be removed from the list.*

- B. Elimination of Automatic Grandfathering: Under Version 3.0, ENERGY STAR has made a significant change with regard to product qualification and labeling during specification transitions. **Please note that ENERGY STAR qualification is not automatically granted for the life of the product model.** To carry the ENERGY STAR label, a product model must meet the ENERGY STAR specification in effect on the model's date of manufacture.

*Note: ENERGY STAR has made this important programmatic change for three reasons:*

- 1. To deliver on expectations about ENERGY STAR by ensuring that the products perform at levels promised by the program.*
- 2. To ensure that ENERGY STAR's ability to differentiate more efficient products is not undermined by high percentages of labeled products qualifying at less stringent performance levels.*
- 3. To facilitate accurate projection and accounting of carbon emission reductions and energy savings associated with ENERGY STAR.*

- 6) **Future Specification Revisions**: ENERGY STAR reserves the right to change the specification should technological and/or market changes affect its usefulness to consumers, industry, or the environment. In keeping with current policy, revisions to the specification are arrived at through industry discussions.